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6WQ-S

October 11, 2011

Mr. Philip Dellinger
Chief-Ground Water/UIC Section
US Environmental Protection Agency - Region 6 Office
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Re: UIC Area Permit – CO₂ Authorization
Draft Permit – Redline Version
NBU! – Osage County, Oklahoma

Dear Mr. Dellinger:

Enclosed is the Chaparral Energy, L.L.C. response to the Draft Permit referenced. We have previously emailed this to you, but as promised here is a hard copy of the changes Chaparral would like to see made.

If you have any questions please contact us at the address listed.

Sincerely,
Chaparral Energy, L.L.C.

David P. Spencer
Manager of Regulatory Affairs
Direct Number: (405) 426-4397
Direct Fax: (405) 425-8897
E-Mail: david.spencer@chaparralenergy.com

Enclosure

Cc: Mr. Ray Leissner, Environmental Engineer, US EPA, Region 6, Dallas, Texas w/copy ✓



Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

UIC AREA Permit No. 06S124P6273

AUTHORIZATION TO CONVERT or CONSTRUCT INJECTION WELLS UNDER THE UIC PROGRAM OSAGE MINERAL RESERVE WITHIN THE AREA SPECIFIED

In compliance with the provisions of the Safe Drinking Water Act, (hereafter referred to as "the Act" or "SDWA") as amended (42 U.S.C. §300f et seq.),

Chaparral Energy, L.L.C.
701 Cedar Lake Blvd.
Oklahoma City, Oklahoma 73114

is authorized to convert any existing well or construct new injection wells anywhere within the area included in: **the SE/4 of Section 10, the S/2 of Section 11, the SW/4 of Section 12, all of Section 14, and the N/2 of Section 23, all in Township 27N, Range 5E** to inject make-up and recycled water (which may contain hydrocarbon gases, salt water, and possibly trace amounts of H₂S gas), and carbon dioxide (CO₂) for enhanced recovery of oil from the Burbank Sandstone formation (Burbank Sand). The Burbank Sand ranges between approximately 2980 to 3050 feet below land surface. For purposes of clarifying injection well or monitoring well construction requirements, the base of underground sources of drinking water is 245 feet subsurface in the area specified above. Should this permit be amended to include additional areas, the depth to the USDW for each new area will be specified and used by reference for this area only.

- not necessary if gas not subject to RCRA

Comment [DS1]: Some state UIC Departments require all significant injectants to be listed. Unfortunately, because Chaparral is using anthropogenic CO₂, there can be 1 to 2 % of impurities in the CO₂ feed stream. Besides H₂S, there can also be various inert gases, and NO_x.

Comment [DS2]: Chaparral wants to make sure that if the USDW is deeper in another area that that depth will not be retroactively applied to this area. This also makes this permit a living document which recognizes that other area of the North Burbank Field will become part of this process.

Wells may be constructed or converted to injection in the permit area provided the well is within the permit area, the well is operated by the permittee and the well is in compliance with all Parts of this permit. Any new well constructed or converted for this purpose shall comply with minimum construction standards, operational requirements, testing requirements, monitoring requirements and reporting requirements set forth in this permit prior to initiating injection. This permit does not affect the authorization status of injection wells existing on the permit area on the effective date of this permit. Such wells may be added to this permit upon written request of the permittee, including proof that the well complies with this permit and written approval by the Director, Water Quality Protection Division ("Director"). Prior authorization terminates on the effective date of inclusion under this permit.

The permittee shall receive separate authorization to inject for each well before using a well to inject fluids. Authorization to inject will be granted upon the Director's confirmation that the operator is compliant with all applicable requirements set forth in this permit and the Osage Class II underground injection control ("UIC") program regulations. Noncompliance with any permit conditions may subject permittee to enforcement according to the SDWA and termination of authorization to inject for that well.

Authorization to inject may be verbally granted by the Chief, Ground Water/UIC Section ("Chief") or by written "Authorization to Inject" from the Director. Verbal authorization to inject shall be confirmed in writing by the Director. A well included under this permit

will remain under this permit until it is plugged or this permit is terminated. ~~A well's authority to inject under this permit may be terminated upon conversion to production, workover, temporary abandonment, or loss of mechanical integrity.~~ During periods wherein a well under this permit is converted to production, its status (producer) must be provided on each report required under this permit for that well. A well's authority to inject may be reissued upon reconfirmation that the well meets the conditions of this permit and demonstrates mechanical integrity.

~~Deviations from the construction requirements of this permit are considered a major modification to this permit unless managed by increased monitoring or reporting. Major modification to the permit will require the public participation. Increased monitoring or reporting will be addressed as a minor modification to this permit.~~

~~This permit is subject to the attached "Special Permit Conditions"~~

This permit shall become effective on

Prepared by

Issued on

Ray Leissner
Environmental Engineer
Ground Water/UIC Section

Miguel I. Flores
Director
Water Quality Protection Division

6WQ-SG: RLEISSNER: [DATE] 06S124P6273
6WQ-SG 6WQ-S
DELLINGER DWYER

*OR any reports
regarding the loss of mechanical integrity*

Comment [DS3]: This may be internally required language by EPA, however, just doing a workover to replace tubing or packer should not be cause for total termination. Chaparral realizes that the loss of MI or this type of work would require another MIT before reusing but it is extreme to make us re-apply for authority to inject. Later in this paragraph you address the reissuance of authority upon meeting the terms of the permit conditions. Also in floods wells may be TA'd to adjust the injection pressure or pattern in an area and then the well would need to be used immediately for injection (not wait days, or weeks for approval from EPA in Dallas). We feel this needs to be cleaned up or eliminated.

Comment [DS4]: This is all addressed in the subsequent "Special Permit conditions", therefore this paragraph is unnecessary.

*Kept language -
purpose of TP& to
acknowledge the
public participation
requirement for
deviations from the
construction regmnts*

Part I. SPECIAL PERMIT CONDITIONS

A. Construction Requirements for Converting Wells Existing Prior to this Permit

1. Cement shall be placed behind all casing strings, from the top of the Burbank Sand to a height of at least 500 feet above the top of the Burbank Sand.
2. The outermost casing(s) through underground sources of drinking water ("USDWs) shall be cemented to a depth of at least 50 feet below the base of USDW. For the initial permit area, the base of the USDW is set at 245 feet subsurface. Should this permit be amended in the future to add additional areas, new depths to the base of the USDW will be specified for each area.

~~For those existing wells without surface casing or whose surface casing does not allow compliance with condition I. A. 2., the top 500 feet of the outermost casing(s) must be cemented to surface.~~

Keep as is. It is better to have it than not. Why not? It is better to have it than not. Corrected

3. Prior to initial authorization to inject, the permittee shall provide evidence to the Director of compliance with Parts I. A. 1. and A. 2. above by submitting cementing record and either a cement bond log or temperature log. The permittee shall notify the Osage Nation Environmental and Natural Resources Department (Osage Nation ENRD) at least five days before testing a well under this Part.

Comment [DS5]: This part (actually #3) needs to be eliminated. It makes no sense and is contradictory of #2 above.

4. Injection shall be through tubing and packer. The packer shall be set within 75 feet of the uppermost injection perforation or top of open hole.
5. All cements, casings, liners, tubings, packers and tubing-casing annulus fluids employed shall be designed to withstand the anticipated acidic environment.

Comment [DS6]: We will attempt to notify Osage ENRD but to make this a hard requirement is burdensome, and could be a large time delay factor. You do not specify they must witness the event so why have at all. Also if a log is presented there should be no need for the Osage ENRD to be present at every occurrence.

6. Burst pressure for the tubulars comprising the tubing/casing annulus shall be rated at 1.5 times the highest differential pressures to which they will be exposed down hole. Existing wells unable to meet this condition shall be equipped with a pop-off valve set to relieve pressures exceeding 10% above maximum authorized surface injection pressures (MASIP).
7. The tubing/packer/casing or liner annulus shall be filled with a corrosion inhibiting fluid.
8. All wells shall be equipped with standard female fittings with cut-off valves affixed to the wellhead in a manner that allows opportunity to detect pressure in each annulus between the tubing and surface casing

there isn't a need but the office wants the opportunity

B. Construction Requirements for Newly Drilled Wells

1. Newly drilled wells shall be constructed with surface casing set to at least 500 feet subsurface and cemented back to surface.
2. Long-string casing shall be set at least to the top of the Burbank Sand formation, and cemented back to surface. If cement is not circulated on the long-string a cement bond log or temperature survey shall be run and submitted to the Section Chief showing bonding of at least 500 feet above the Burbank formation (as required in condition I.A.1.)

directly

OK accepted

Comment [DS7]: Since we know operationally this may be impossible (bad thief zone in the Osage Layton interval which can range from 1400' to 1700' in this area), why require it? This addition gives chaparral a way to show that the Burbank formation is adequately contained as in the existing wells referenced construction requirement.

3. Prior to initial authorization to inject, the permittee shall provide evidence to the Director of compliance with Parts I. B. 1. and B. 2. by cementing record and either a cement bond log or temperature log. The permittee shall notify the Osage Nation ENRD at least five days before testing a well under this Part.
4. Injection shall be through tubing and packer. The packer shall be set within 75 feet of the uppermost injection perforation or top of open hole.
5. All cements, casings, liners, tubing, packers and tubing-casing annulus fluids employed shall be designed to withstand the anticipated acidic environment.
6. Burst pressure for the tubulars comprising the tubing/casing annulus shall be rated at 1.5 times the highest differential pressures to which they will be exposed down hole.
7. The tubing/packer/casing or liner annulus shall be filled with a corrosion inhibiting fluid.
8. The well shall be equipped with standard female fittings with cut-off valves affixed to the wellhead in a manner that allows attachment of a gauge with a standard male fitting to allow for monitoring pressure in each annulus between the tubing and surface casing.

OK accepted

Comment [DS8]: Again, if a log is presented why require Osage ENRD involvement. See Comment DS6 above.

↑
the notification requirements was not intended to apply to the logging request of B2. Rather it was to apply to MI testing. Moved sentence to

C. Area of Review (AOR) Corrective Action

1. Before receiving authorization to inject for any well authorized by this permit, the permittee shall complete corrective action and reporting on any well bore within ¼-mile AOR of the injection well according to Parts I. C. 2. through C. 6. where the permittee is the owner/operator of such a well, and such action will not interfere with any other operator. When wells have been totally abandoned, permittee shall obtain permission of the Osage Agency, Bureau of Indian Affairs before beginning such actions.
2. Any producing, temporarily abandoned, or injection well within the AOR existing before the effective date of this permit shall be constructed according to Parts I. A. 1, A. 2, and A. 6. Any producing, temporarily abandoned, or injection well within the AOR constructed after the effective date of this permit shall be constructed according to Parts I. B. 1, B. 2, and B. 5. Any wells within the AOR to be plugged or re-plugged will be plugged according to standards specified in Part I. C. 3.
3. Any well plugged after the effective date of this permit shall be plugged according to procedures set forth in 40 CFR §147.2905 or as directed by the EPA Tulsa Field Office (EPATFO). Permittee shall provide plugging plans to the Osage Nation ENRD for approval by EPATFO at least five days before initiation of plugging operations.
4. Upon receipt of evidence of upward migration of fluids into or between USDWs, the Chief may require the permittee to replug a well previously recognized as plugged, if that well is suspected of contributing to the upward migration.

inj rate must be reduced to not impact well if CA cannot be done

Comment [DS9]: Although not anticipated, this addresses the fact that others may have wells that may be effected by our flood. We could offer to help or work with them, but we can not say that Chaparral will workover someone else's well.

Called Edwin discussed this issue. Chaparral may not be able to set a new well as close as ICG requires if they do not own the lease. This should not be a problem for the first well.

Edwin

405-426-4081

5. The permittee shall submit to the Chief a copy of a signed BIA Form No. 208 or 139, whichever is appropriate, showing the work completed on each well for which corrective action was required.
6. If the permittee cannot locate or implement effective corrective action on any well of record requiring corrective action, a monitor well shall be constructed according to the requirements of Part I. E. Such monitor wells shall be located no more than 25 feet from the recorded location of the subject well. Monitoring and reporting shall be conducted according to the requirements in Parts I. G. and H.
7. After injection commences, corrective action shall be completed, as directed by the Chief, any time evidence of fluid migration into underground sources of drinking water is detected or reasonably suspected.

D. Monitor Well Network

1. A network of monitoring wells shall be constructed to encompass the permit area and may be repositioned to enhance detection of fluid migration into USDWs. This system shall include one monitor well to be placed within 50 feet of the intersection of all quarter sections in the permit area. These monitor wells may be repositioned, if approved by the Chief, to fulfill Part I. C. 6. or in consideration of other criteria including: accessibility, results of corrective action, coverage across the permit area and location of water supply wells.
2. Monitor wells shall be completed, as required in the quarter section before, before initiation of CO₂ injection or when the static fluid level in the injection zone, any place within the quarter section, is higher less than 245 feet subsurface the defined USDW level for the area, whichever comes first.
3. Before receiving authorization to inject for any well authorized under this permit, the permittee shall submit to the Chief a copy of a report showing construction details of each monitoring well required under Parts I. C. 6. or I. D. 1. of this permit.
4. Monitor wells shall be constructed according to Part I. E. of this permit.

Accepted but rewrote his proposed language

Comment [DS10]: This might imply that a monitor well is required in every quarter section.

Comment [DS11]: Maybe this should read "area of influence". The wording "quarter section is very large and broad and outside the scope of the EPA jurisdiction."

E. Construction Requirements for all Monitor Wells

1. Each monitor well shall be constructed in a manner allowing periodic acquisition of a sample, representative of water quality in the well at a depth of approximately 10 feet above the USDW level for the specified area 235 feet subsurface. Each monitor well shall be drilled and screened for 20 feet to allow for sampling of the lowest water bearing aquifer at the specified USDW for that area or below the minimum 245-foot depth in the

*accepted
rewrote*

wellbore.

Comment [DS12]: Makes this a more living, universal document.

2. The casing in each well shall be a minimum of 2 inches in diameter, extend at least two feet above the surface, be set with cement and/or bentonite from the top of the screened interval to the surface, and secured with a cement pad at the surface capable of preventing surface fluid flow into the well. Details for the construction of ground water monitoring wells can be found in EPA's guidance document: RCRA GROUND-WATER MONITORING: DRAFT TECHNICAL GUIDANCE.
3. Each monitor well shall be secured with a lockable cap, protected to prevent accidental damage from vehicular traffic, and permanently marked with its company identification number and global positioning system coordinates.

F. Injection Well Operating Requirements

1. The permittee shall demonstrate, to the satisfaction of the Director, that the injection well has no significant leak in the casing/tubing annulus and allows no fluid migration through vertical channels behind the casing pursuant to 40 CFR §147.2920(b) (1) (i) and (2) (ii) or (iii) respectively. The demonstration of mechanical integrity (MI) must be made at least once every five years thereafter. The Director may require increased frequency of this testing if circumstances deem it prudent. To acquire authorization to inject (ATI), the permittee must submit a successful MI demonstration and proof of cement behind the well's casing(s) in the form of "as built" diagrams with supporting cement bond log(s) or temperature log(s) to the Chief. The Chief may issue ATI either verbally or in writing upon finding the well is compliant with the construction and MI requirements of this permit.
2. Following the initial mechanical integrity test demonstration, the permittee shall place a gauge or other monitor on the tubing/casing annulus so that any pressure will be detected immediately. This monitoring shall be reported on the EPA Annual Monitor and Injection Report. The report will contain the number of times monitored per month and any pressure if found. maintain a positive pressure on the tubing /casing annulus. This pressure shall be exerted by a fluid column in hydraulic communication with the annulus of not less than 2 feet above the bradenhead. The reservoir for this fluid shall be a barrel equipped with sight glass positioned in elevation as to maintain the positive pressure. The barrel's capacity shall be maintained and sufficient to allow for volume fluctuations from operational causes. A record shall be maintained by the operator showing all dates and volumes of annular fluid added or extracted from the barrel for the previous 6 months of operation.
2. MASIP at the wellhead shall not exceed 850 psig during injection of saltwater and 2165 psig when injecting CO₂.
3. The permittee is authorized to inject salt water and CO₂ for purposes of enhanced oil

Not recorded -
We replaced with standard permit language. For made the case that having a operation placed pressure gauge could not be trusted. And the barrel was outdated.

Comment [DS13]: This removes the "Monitor Barrel" as we all agreed to previously.

recovery. Injection of salt water and CO₂ may be alternated without prior approval.

- 4 For each injection well authorized under this area permit the maximum injection volume for saltwater is 124,000 barrels per calendar month.
- 5 For each injection well authorized under this permit the maximum injection volume for CO₂ is 186 million cubic feet (MMCF) per calendar month. These authorized CO₂ volumes are at standard temperature and pressure (STP). All volumes of CO₂ injected will be reported as if measured at STP.

G. Monitoring Requirements

1. Quarterly, the permittee shall measure static water level and analyze for chlorides, total dissolved solids (TDS) and alkalinity in each monitor well. Samples are to be analyzed according to procedures set out in the most recent edition of Standard Methods for the Examination of Water and Wastewater. To ensure appropriate collection and analysis the permittee must submit a field sampling plan and quality assurance project plan.
2. The permittee shall utilize the first sampling results to establish baseline groundwater quality for that monitor well's vicinity. The first quarterly sample must be acquired prior to injection in the vicinity.
3. If at the end of two years no monitoring results exceed thirty percent of the baseline, established by the first quarterly sample analysis in Part I. G. 2., the frequency of sampling shall may be reduced to once a year on approval of the Chief.

Comment [DS14]: Clears up intent.

Not accepted - implies the chief must reduce sampling, use can

H. Reporting Requirements

(a) Ground Water Quality Report

1. The permittee shall provide to the EPA, Region 6 a quarterly report of monitor well sampling during the prior quarter. The reports shall be submitted by the dates shown below. The reports shall include a summary of the analytical results from each monitoring well sampled in chronological order of each sampling event and signed and dated by the submitting company official, unless the frequency of sampling has been reduced per Part I.G.3.. At which time the report shall be submitted with the annual EPA Monitor and Injection Report for the well.

Accepted - rewritten

Comment [DS15]: This removes a potential non-compliance issue if the monitoring frequency is changed.

<u>Report Due Date</u>	<u>Reporting Period</u>
March 1	October – December
June 1	January – March
September 1	April – June
December 1	July - September

2. The permittee shall orally report to the EPA, Region 6 within 24 hours of receiving analytical results exceeding a thirty percent (30%) increase above baseline values determined under Part I. G. 2.
3. Within five days of the oral report, provided in Part I. H. (a) 2., the permittee shall submit a written report to the EPA, Region 6 providing the status of their investigation into the increases and any subsequent corrective actions proposed or taken to protect USDWs.

(b) Well Identification/Status Report

1. At the beginning of each month the operator will provide a Well Identification/Status Report (WISR) spreadsheet electronically to EPA Region 6. In column fashion the spreadsheet will identify by well number and location, all wells currently authorized under the permit or in process of coming under the permit. In addition, the report must certify that the $\frac{1}{4}$ mile AOR corrective action requirements for each well currently injecting ~~as are~~ completed and the date of its last successful mechanical integrity test.
2. Each WISR report shall include a plat map of the project area. This plat map shall show the location of all injection wells listed in the WISR report and all monitoring wells currently operating. Once the entire authorized permit area ~~of the permit~~ is fully incorporated-developed under the permit, the operator may cease submission of the plat map. If the area permit is modified to include additional areas within the Burbank Field, submission of the plat map will be required again, for that specified area.

Accept
Remove

Comment [DS16]: Why require a plat when you have a WISR? What will the plat show?

~~is a little drastic in this wording.~~

Comment [DS17]: Don't know where this crept in from? Probably an earlier comment that got de-attached from somewhere.